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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

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In the Matter of	)	
	)	
Amendment of Part 90	)	
of the Commission's Rules	)	PR DOCKET NO. 93-61
to Adopt Regulations	)	RM-8013
for Automatic Vehicle	)	
Monitoring Systems	)	
	)	

REPLY COMMENTS OF NORTH AMERICAN TELETRAC AND LOCATION TECHNOLOGIES, INC.

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SUMMARY

Teletrac has submitted independent studies in this proceeding addressing the key issue of whether it is feasible for wideband pulse-ranging systems to share spectrum with other LMS systems. Those studies have demonstrated that co-channel separation of 8 MHz systems is essential to the success of wideband pulse-ranging technology. The arguments advanced for sharing between wideband pulse-ranging LMS systems and other LMS systems make no technical or economic sense. These sharing proposals would create chaos and stifle the development and deployment of wideband pulse-ranging systems, depriving the public of the unique benefits of these systems, increasing the cost of LMS service, and threatening the future of the only commercially operating wideband pulse-ranging system -- Teletrac's.

A wide variety of commenters in this proceeding have agreed with these fundamental points. Among the providers of narrowband and non-pulse-ranging systems, only Amtech argues that such systems should share spectrum with wideband pulse-ranging systems. Other operators, such as Hughes Aircraft Co., Mark IV IVHS, AT/Comm and SAAB-Scania, all support the Commission's separation proposal.

Amtech's arguments are misplaced because they overstate the costs and burdens of the Commission's migration proposal.

-- No tags will be affected by the NPRM's migration proposal.

-- Only a small number, at most, of Amtech's 1300 "frequency agile" tag readers will have to be retuned.

-- Teletrac has proposed to grandfather readers in place as of May 26, 1992, the date of the Teletrac Petition.

-- Other readers can remain in the wideband pulse-ranging segment on a secondary basis as proposed

Southwestern Bell advocates limiting LMS systems to 4 MHz. However, as demonstrated in our Opening Comments, that proposal, which is not backed by any specific support, would make no technical or economic sense and would be spectrally inefficient. Indeed, Southwestern Bell's arguments are internally inconsistent.

The comments have provided no reason to reject the Commission's proposal to leave existing forward links where they are currently located; nor do they offer any justification for introducing a new and confusing distinction between "wide area" and "local area" LMS systems. The Commission's proposals on these points are workable and well supported and should be adopted.

Finally, a number of Part 15 and amateur radio users fear that this proceeding will affect their status in the band, but the Commission has already confirmed that it will not. Such users have, as many have commented, coexisted well with Teletrac's system. No credible evidence has been presented to suggest that this situation will change with the adoption of permanent LMS rules.

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TO: The Commission

REPLY COMMENTS OF NORTH AMERICAN TELETRAC AND LOCATION TECHNOLOGIES, INC.

In opening comments only North American Teletrac and Location Technologies, Inc., doing business through their joint venture Pactel Teletrac ("Teletrac"), presented independent factual information concerning the crucial issue presented by the Commission's Notice of Proposed Rulemaking (the "NPRM") -- whether it is feasible for LMS systems to share the 902-928 MHz band. That information included

-- a report on the technical feasibility of sharing between wideband pulse-ranging systems prepared by Dr. Raymond Pickholtz, Professor of Engineering at George Washington University, a leading authority on spread spectrum technologies (Appendix 1 to the Comments). Professor Pickholtz concluded sharing was not technically feasible;

-- a field test and study of interference between wideband systems, conducted by Teletrac and reviewed by Professor Pickholtz (Appendix 2 to the

Comments). That field test and simulation significantly reinforce Professor Pickholtz's conclusions that sharing is not viable;

-- an independent study on the economics of sharing prepared by Dr. Richard Schmalensee, Professor of Economics at the Massachusetts Institute of Technology ("MIT") and Dr. William Taylor, Senior Vice President, National Economic Research Associate ("NERA") (the "Schmalensee-Taylor Study") (Appendix 3 to the Comments); and

-- a discussion of the LMS business prepared by Paul Jansen, a Principal at McKinsey & Company, Inc. (Appendix 4 to the Comments).

These studies conclusively demonstrated, both on business and economic grounds, that sharing would make little sense in this service. In particular:

a. co-channel separation is essential to the success of wideband pulse-ranging LMS operations, a technology that offers service innovations that cannot be had with other technologies; and

b. the arguments advanced for wideband LMS sharing make no technical or economic sense, and would cause chaos rather than expansion of the industry. Further, sharing would stifle rather than promote competition.

Many commenters in this proceeding have agreed that these points are valid and that frequency sharing makes no sense. (See

Comments of Hughes Aircraft Co., Mark IV IVHS, Southwestern Bell, MobileVision, Florida Department of Transportation, SAAB-Scania and Texas Instruments/MFS Network Technologies, Inc.). Nonetheless, other commenters continue to advance illogical and often contradictory arguments, again without any independent technical support. For example, although Pinpoint and Amtech[1] continue to maintain that sharing will work, they now concede there will be "black out areas" and that detailed technical rules will be needed. (Pinpoint Comments at 27; Amtech Comments at 20).

Southwestern Bell proposes a channel plan of 4 MHz, although it claims to have a system that will work on 2 MHz. (Southwestern Bell Comments at 9-10). Pinpoint and MobileVision, on the other hand, claim 8 MHz is the "minimum acceptable bandwidth for IVHS applications." (Pinpoint Comments at 33; MobileVision Comments at 36-40). In contrast to Pinpoint and Amtech, Southwestern Bell advocates co-channel separation. (Southwestern Bell Comments at 12-14 and n.25).

MobileVision,[2] among others, wants the forward link moved to a different frequency, even though one year ago MobileVision

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[1] As the Commission will recall, Pinpoint Communications, Inc. ("Pinpoint"), the only purported wideband pulse-ranging commenter advocating the sharing of the band, is represented by Amtech Corporation's counsel. Although Pinpoint has publicly admitted that its system does not work, it has, without any independent technical support, slavishly followed Amtech Corp.'s position on sharing before the Commission.

[2] There seems to be some question -- according to Southwestern Bell -- as to whether MobileVision has a system or is likely to have one in the near future.

supported Teletrac's proposal, under which the forward links would stay where they are.[3]

It is fair to say that the comments filed are a hodge-podge of rhetoric with no independent support for the proposals set forth. Indeed, the only common denominator seems to be that Teletrac has a technology that works, and has commercially operating systems providing service to customers. Even Pinpoint acknowledges in the press that Teletrac "offers the best quality and technology currently in the market."[4] Therefore, Teletrac must be stopped. For example,

-- Amtech proposes arbitrarily that, "Mobiles should transmit no more than 10 milliseconds in any 100 millisecond time period." (Amtech Comments at 33). Since Teletrac transmissions are approximately 20 milliseconds, that rule would effectively terminate Teletrac service.

-- Pinpoint, joined now by MobileVision, proposes forward links that are somewhere

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[3] Comments of MobileVision LP in Support of Teletrac Petition for Rulemaking, July 23, 1992 at 14 (the "proposed rules provide for a standardized forward link in each band. The Commission should adopt Teletrac's proposal.").

[4] "Pactel Teletrac's Fleet Director Good for Industry, Businesses Say," Telephone Week, April 12, 1993 at 3. Exhibit 1. Thus, while some oppose Teletrac's position before the FCC on the ground, among others, that Teletrac will become a de facto standard, (Pinpoint Comments at 14; Southern California Edison Comments at 15), Pinpoint applauds the emergence of that leader in other fora.

other than the existing forward links. (Pinpoint Comments at 21-22; MobileVision Comments at 43-44). Since neither company is presently in commercial operation, and since only Teletrac has a large installed base, again, the principal objective seems to be to cause Teletrac to lose that installed base.

-- Southwestern Bell proposes a channel plan that would obsolete existing investment and, of course, dislocate customers, all of whom happen to be Teletrac's customers. (Southwestern Bell Comments at 10).

As we discuss in detail below, practical rules envision co-channel separation for wideband pulse-ranging systems and migration of identification systems. The other necessary rules fall into place once that realistic regulatory architecture has been implemented.

DISCUSSION

I. CO-CHANNEL SEPARATION IS REQUIRED TO ASSURE THE VIABILITY OF WIDEBAND PULSE-RANGING SYSTEMS

A. The Teletrac System Is Currently Providing Valuable Service To Public And Private Consumers

Teletrac's wideband pulse-ranging system is presently providing valuable services to a variety of private and public entities. Many letters supporting Teletrac's services were attached to Teletrac's Petition for Rulemaking (See Petition, Appendices A to J). Commenters continue to make the point that

the Teletrac technology is in use, is real, and is delivering public benefits right now.

For example, the Federal Bureau of Investigation has stated to the Commission:

> Without making public the specific ways in which the FBI is utilizing these services, our surveillance capabilities have been significantly enhanced by the use of these commercial services. Very positive results are being obtained daily in on-going FBI investigations. The use of these services by our field offices in the metropolitan areas where the service is available is rapidly increasing.
>
> The FBI supports in principal those requests found in the referenced rulemaking petition. This includes the co-channel separation requested for AVM Systems. The FBI hopes that the Commission weighs all issues carefully to prevent any degradation in the quality of radio location services currently being provided.[5]

The Drug Enforcement Administration ("DEA") also receives ongoing real world operations support from Teletrac. For example, DEA's South Florida High Intensity Drug Trafficking Area Task Force comments:

> The Task Force has specifically targeted transportation modes as a vulnerability of drug trafficking organizations. Automated vehicle location is a weapon in that effort.
>
> Pactel Teletrac and their 900 MHz vehicle location technology has helped us in this effort. Their very reliable system has significantly enhanced our ability to observe suspects from a distance, often miles away. This ability has greatly increased Agent

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[5] Letter from William Bayse, Assistant Director, FBI Technical Services Division, dated May 14, 1993 (emphasis supplied), filed in PR Docket No. 93-61.

safety and reduced our manpower requirements

> allocation would be appreciated by our Agency.[7]

Increased law enforcement effectiveness is only one important service Teletrac now offers. Teletrac's fleet management services, augmented by status messaging, is enhancing efficiency, reducing costs and increasing consumer satisfaction. These enhancements are being used by an ever increasing number of companies. Letters filed with Teletrac's Petition (Exhibits A to J) demonstrated such presently available benefits from Teletrac's system.[8] For example, the United States Postal Service has reported to the Commission:

> The Chicago office of the United States Postal Service has entered into a contract with PacTel Teletrac. USPS has been improving productivity, thereby reducing costs and increasing our responsiveness to our customers. Teletrac is aiding us in that effort.
>
> Two hundred new USPS vehicles serving the Chicago area have been equipped with Teletrac units since 1992.
>
> We are using Teletrac to manage our fleets and to increase the personal security of our drivers to route personnel. We expect to

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[7] Letter of C.W. Skalaski, Chief of Police, City of Coral Gables, Florida, dated April 27, 1993, filed in PR Docket No. 93-61 on May 13, 1993.

[8] For example, Superior Signal Service, in a letter attached as Exhibit B to Teletrac's Petition, stated that, "Due almost exclusively to Teletrac and our ability to document the activities of our vehicles, we realized a savings on not only the automotive portion of [our] insurance but a significant consideration was given to the liability section as well."

expand our use of the Teletrac system, further decreasing our costs.[9]

Intelligent Vehicle Highway Systems ("IVHS") hold much promise for the future. Teletrac is a way to that future. For example,

-- Teletrac is a participant in Project Direct. That project, taking place in Detroit, involves equipping 30 vehicles with radio location units to monitor how drivers respond to traffic information.

-- In Los Angeles, under the auspices of the Los Angeles County Transportation Commission, 150 tow trucks have been equipped with Teletrac units to streamline assistance to disabled vehicles.

-- In conjunction with Houston Mass Transit, Teletrac has agreed to provide 120 Teletrac equipped vehicles for handicapped commuter service.[10]

The Comments of IVHS America confirm that Teletrac is the only wideband pulse-ranging system currently offering IVHS services (IVHS America Comments at 8) and that such systems are necessary to the national deployment of IVHS services. (Id. at 10). IVHS America supports protecting Teletrac "to the

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[9] Letter of J. Cherr, U.S. Postal Service, Processing and Distribution Center, dated April 30, 1993, filed in PR Docket No. 93-61 on June 29, 1993 (emphasis supplied).

[10] Teletrac's services are also of use to the hearing and speech impaired, especially in emergency situations.

maximum extent possible from interfering uses." (Id. at 18, emphasis supplied).

Thus the commercially operating Teletrac system is essential to the provision of a variety of services and users. The system's real world versatility and reliability suggest that, if allowed to flourish under a realistic set of permanent rules, Teletrac-like systems will spur innovation in a number of areas.

B. Narrowband Systems Must Be Migrated

1. Most Identification System Vendors Support Migration

In its Petition and Opening Comments, Teletrac conclusively demonstrated, with independent technical support, that narrowband systems create substantial interference for wideband pulse-ranging systems. Accordingly, the Commission's proposal to migrate narrowband systems makes eminent technical, economic and common sense and should be adopted.

Comments from manufacturers of automatic vehicle identification equipment -- other than Amtech -- support the migration proposal. For example, Hughes Aircraft Co. ("Hughes") has developed what it calls a vehicle to roadside communications system ("VRC"). Hughes explicitly represents to the Commission that its VRC system, which it describes as spectrally efficient, could effectively operate in the 902-904, 912-918, 926-928 MHz bands (Hughes Comments at 7). Hughes appears to be a commercial system since it has been already awarded a contract to install its VRC technology along Interstate 75 and along Canada Highway 401 in Ontario. (Id. at 4). Texas Instruments/MFS Network

Technologies, Inc. similarly recognizes the need to separate wideband and narrowband systems. (TI/MFS Comments at 11).

AT/Comm, Inc, another identification system manufacturer that provides toll tag services on the Illinois Tollway and at other locations, also supports migration and co-channel separation between wideband pulse-ranging and narrowband systems. (Comments of AT/Comm).

Mark IV IVHS Division ("Mark IV") also finds no fault with the Commission's proposal. Like Hughes, Mark IV is operating, having been installed at more than 31 locations in nine states (Mark IV Comments at 4). Mark IV has applied for several other locations. (Id.). Yet, Mark IV recommends

> Licensing of short-range systems should be based upon exclusive-use channelization with co-channel separation requirements in the 902-904 MHz, 912-918 MHz and 926-928 MHz bands to facilitate rapid and effective licensing and deployment of the IVHS systems which we expect will be needed to meet the

Mark IV also proposes that tag reader systems be given secondary status in the wideband pulse-ranging allocation. (Mark IV Comments at 10-11). Teletrac supports that proposal as well. Teletrac has never objected to others operating in the band under technically correct criteria, as long as those secondary tag readers are operational in a manner that does not cause interference to wideband pulse-ranging systems.

Other commenters also support migration. For example, the Florida Department of Transportation makes clear that the potential for interference is real. (Florida Comments at 1-2). Florida recommends that a new band be allocated for toll collection and IVHS needs. (Id. at 2).[11] SAAB-Scania, another tag reader manufacturer, supports a proposal to migrate tag readers to 2450 - 2483.5 MHz. (SAAB-Scania Comments at 11). In Europe, Amtech is already operating at 2.4 GHz.[12] Indeed, SAAB-Scania recognizes that, absent separation, there is a likelihood interference will debilitate its systems.

> Since the power levels at which the associated vehicle tags operate are necessarily low, the introduction into the radio environment of multiple 300 watt, co-channel transmitters installed along the highways (as is contemplated within the NPRM)

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[11] IVHS America has formed a group to find additional spectrum for IVHS services. This group was formed after the California Transportation Department expressed an interest in finding alternative spectrum for its tag reader system.

[12] Amtech has also received FCC authority to operate at 2.4 GHz in this country. See FCC Equipment Authorization, FCC ID No. FIHXI1400-AI1400. See also Krauss Affidavit at ¶ 8 filed as Exhibit A to Teletrac's Reply Comments in Support of its Petition.

> will create a substantial threat to the reliable operation of these systems. It is well within the boundaries of reason to predict that following the installation of a proposed LMS system within a market, ETTM systems will quickly degrade due to co-channel interference and a substantial increase in the noise floor.
>
> -- SAAB-Scania Comments at 4

(See also AT/Comm Comments). Thus, the overwhelming weight of the comments from identification system manufacturers is that the Commission's proposal for separation of wideband pulse-ranging systems from other LMS systems is sound, low cost and pro-competitive.

2. The Opposition of Pinpoint and Amtech to Migration is Contrary to Sound Analysis

Pinpoint acknowledges that narrowband tag reader systems will cause "black out areas" to wideband pulse-ranging systems (Pinpoint Comments at 27), but, apparently to mollify Amtech, claims the problem is not that serious. (Id). Even Amtech finally has been forced to admit the existence of blackout areas. (Amtech Comments at 20).

Interestingly, Pinpoint and Amtech disagree on one key issue -- the susceptibility of Amtech tags to interference from Pinpoint's proposed system. Pinpoint claims that the received signal from an Amtech tag is at the -10 to -20 dBm level (Pinpoint Comments at 29), while Amtech indicates power levels 40

dB lower.[13] Pinpoint proposes to deal with interference into its system from Amtech-like systems by locating the Pinpoint forward link transmitters within 1000 to 3000 feet of the Amtech tag-reader system. (Pinpoint Comments at 29). We calculate that the signal in the tag-reader receiver's passband from a Pinpoint forward-link transmitter located 1000 feet away from the tag reader will be 30 dB stronger than the modulated signal from an Amtech tag ten meters from the reader.[14] Even with reasonable allowance for system performance improvements from the use of directional antennas, Pinpoint's interfering signal could be expected to severely impair the performance of an Amtech tag-reader system. As Dr. Jackson concludes

> Traditional interference calculations indicate that a Pinpoint system operating its forward link at the powers proposed by Pinpoint would knock all nearby cochannel Amtech tag readers off the air.
>
> * * * *
>
> Given these interference predictions, it is hard to understand how the sharing between

Amtech and its supporters take positions inconsistent with the technical facts and ignore those facts when they cannot respond. Amtech argues that it must have freedom to place its tag readers throughout 902-928 MHz to meet the needs of emerging uses.[15] That is simply not correct.

It is absolutely clear that the Amtech system is spectrally inefficient. Jeffrey Krauss, a leading spectrum policy expert, prepared an affidavit analyzing the various technical infirmities in Amtech's technology, filed as Exhibit A to Teletrac's Reply Comments in Support of its Petition for Rulemaking. Amtech has assiduously avoided responding to the Krauss Affidavit at any point in this proceeding. Amtech admits it would be unable to reuse a frequency between a toll plaza and a satellite plaza

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[15] Teletrac's opening comments discussed in some detail a number of recent proceedings in which the Commission has recognized the need for co-channel separation to assure that high quality service can be provided free of disabling interference. (Teletrac Comments at 41-45). Amtech's pleading provides selected quotations designed to leave the impression that spectrum sharing is the key goal of the Commission's spectrum regulation. (Amtech Comments at 28 n.56). However, the Commission has confirmed, even in many of the same proceedings selectively quoted by Amtech, the importance of maintaining a high quality of service. See, e.g., Frequency Coordination in Private Land Mobile Radio, 4 F.C.C. Rcd 6325 (frequency selection important to "ensuring a satisfactory grade of communications service to all users"); Allocation of the 849-851/894-896 MHz Bands, 5 F.C.C. Rcd 3861, 3873 (noting the need to assure operation "on a noninterference basis with adjacent services," and establishing technical standards including frequency separation); Geographic Reallocation of UHF-TV Channels 1 Through 20 to the Land Mobile Radio Services, 23 F.C.C.2d 325, 329 (1970) (noting that the "crowded condition of available frequencies seriously impairs the usefulness of existing land mobile communications systems," and concluding that sharing of existing frequencies will not solve the problem). The bottom line is that sharing can be implemented only where it will not degrade the service offered.

[redacted]

moving frequencies.[16] Indeed, given Mark IV's willingness to migrate quickly, the Amtech cries of cost and burden would appear to lack credibility. There are other sound reasons to conclude that adoption of a migration plan would cause little cost to Amtech. Amtech, in its Comments, agrees with the Teletrac proposal that narrowband licenses in the wideband allocation as of May 26, 1992 would not have to be migrated. (Amtech Comments at 36-37). That includes the majority of installed Amtech tag readers. Further, Amtech admits in its Comments that it has only deployed approximately 1300 tag readers. (Id.). Thus, the potential relocation costs for this small number of frequency agile readers must, in all common sense, be minimal. In any event, if the Commission adopts Mark IV's proposal, which Teletrac supports, to allow identification systems to have secondary status in the wideband pulse-ranging allocation, Amtech need not migrate those tag readers which do not cause interference.

Amtech also claims that it needs additional spectrum for high volume locations like the Oakland Bay Bridge in California (Amtech Comments at 12), which is currently not an Amtech location. Amtech has not demonstrated that the Commission's allocation of 10 MHz of spectrum for identification systems, most

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[16] The federal securities laws require disclosure of material facts.

of which claim to use narrowband technology, is inadequate.[17] Amtech requires 800 kbits/sec to support 20 lanes of traffic, with each lane passing 10 vehicles per second. The 10 vehicle per second rate would be highly unlikely given the average size of passenger cars and the current maximum legal speed limit of 55 mph. It is more likely that less than two cars per second would pass.[18] This would imply a data rate requirement of less than 160 kbits/sec, or one-fifth of what Amtech claims to require. Even if 800 kbits/sec is required, a single 6 MHz channel should be able to support several such systems, given that other services have developed data rates up to 25 times more efficient.[19] Once again, Amtech appears to have little regard for frequency management. The data capacity needed to satisfy the requirements of high capacity locations like the Oakland Bay

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[17] According to a recent news report, the Texas Turnpike Authority has stopped negotiating with Amtech to install a new toll system on the Dallas North Tollway. "Turnpike ends talks with Amtech Group," Dallas Morning News, July 16, 1993 at 1D. (Exhibit 4). The article notes claims by Amtech competitors that inefficiencies in the Amtech system have cost the authority millions in toll revenues, while the Authority states it broke off negotiations because no agreement could be reached on price.

[18] At 55 mph, a car travels only about 8 feet in a tenth of a second. Assuming a reasonable separation of three or four car lengths, we conclude that a single lane would process less than 2 cars per second at a speed of 55 mph.

[19] Digital HDTV systems have been developed that stuff

Bridge would require far less spectrum than three 6 MHz channels claimed by Amtech.[20]

The sum of Amtech's complaint is that, despite the interim rules, it has been permitted to roam at will throughout the band over the past several years and should be allowed to continue to do so. The NPRM proposal would require Amtech to once again comply with the Commission's rules. Simply put, Amtech and its supporters have offered no credible reason to permit narrowband systems to roam at will to the detriment of other users of the band.

The record is clear. Existing narrowband systems should be migrated, as Mark IV has proposed, within six months after the Commission adopts its permanent LMS rules.[21]

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[20] Amtech and CalTrans complain that the availability of only a single 6 MHz channel for tag reader systems creates a "single point of failure" for identification equipment intended to comply with the CalTrans specification. Amtech Comments at 11; see also CalTrans Comments at 6. This rationale raises serious questions since the CalTrans specification has a data rate that can be satisfied with much less than 6 MHz. Moreover, reliance on the CalTrans standard, we respectfully suggest, is misplaced. CalTrans represents merely one of the fifty states. There has been no analysis of the basis for that standard, how it was arrived at, and the likelihood that any other state would accept this standard. Plainly, CalTrans does not set national standards. The United States Department of Transportation is currently evaluating various systems to determine what is necessary for future IVHS applications.

[21] We assume that the Commission will cease licensing narrowband systems in the wideband pulse-ranging allocation as Teletrac has proposed. See Teletrac Comments at 21-23.